UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF RESEARCH AND DEVELOPMENT

MEMORANDUM

DATE: July 11, 2016

SUBJECT: Joint Concurrence on the 2016 RFA, "Oil and Gas Development in the Appalachian Basin."

FROM: Intaek Hahn, Ph.D., Project Officer, Matrix Interface, SHC, WHID/NCER

THROUGH: Darrell Winner, Ph.D., Senior Science Advisor, NCER
Sylvana Li, Ph.D., Division Director, WHID/NCER

TO: James H. Johnson, Jr., Ph.D, Director, NCER

The purpose of this memorandum is to obtain approval for the issuance of the Request for Applications (RFA) titled: Oil and Gas Development in the Appalachian Basin.

Attachment A: Power Point Presentation Slides
Attachment B: Concurrence Meeting Notes

APPROVING OFFICIAL DECISION

_✓_ Approved
___ Modifications Required
___ Denied

Comments:

Approving Official Signature: 7/26/16
James H. Johnson, Jr., Ph.D., Director
National Center for Environmental Research

CC: Bryan Bloomer, Ph.D., Division Director, ASED/NCER
Sherri Hunt, Ph.D., Matrix Interface, ACE, ASED/NCER
Michael Hiscock, Ph.D., Matrix Interface, SSWR, WHID/NCER

BACKGROUND

There has been a rapid increase in oil and gas development (OGD) in the United States during the past decade, aided by technological advances in high-volume hydraulic fracturing and horizontal drilling methods and equipment. This has enabled the economic production of oil and gas from unconventional resources (shales, tight formations, and others). The Marcellus Shale and Utica Shale in the Appalachian Basin are two of the largest reserves for oil and gas, and the Appalachian Basin has become a major center of the "shale gas boom," with unconventional wells spread throughout the region. Concerns have been raised about the potential risks to human health and the environment from chemical and other stressors associated with oil and gas development. The overall purpose of this RFA is to promote research that fills in gaps in our understanding of the potential impacts of OGD on human health and the environment.

The U.S. Environmental Protection Agency (EPA) seeks applications for multidisciplinary research that will foster a better understanding of how the rapid increase of OGD activities in the Appalachian Basin is impacting the surrounding environment and public health. Specifically, research projects are sought that can quantify air and water quality impacts associated with OGD activities and inform related human and ecological exposures. The goal of this research is to develop and compile scientific information that will aid the public and private sectors in implementing environmental policies and best practices that develop oil and gas resources while protecting public health and the environment in the Appalachian Basin.

In July, 2014, the Department of Energy (DOE), the Department of Interior, and EPA published a OGD Research Strategy (Strategy) entitled, "Federal Multiagency Collaboration on Unconventional Oil and Gas Research: A Strategy for Research and Development (http://unconventional.energy.gov/pdf/Multiagency_UOG_Research_Strategy.pdf) This Strategy identified seven research topics, five of which EPA was identified as in a lead or supporting role.

The Strategy identified priority research needs to be addressed:

Water Quality Priority Research Needs

- Determine the Impact of Well Injection (Hydraulic Fracturing Fluids) and Produced Waters on Water Quality
- Assess Wellbore Integrity to Prevent and Minimize Contamination
- Develop Mitigation Technologies
- Identify and Model Water Quality Changes Associated with OGD Life Cycle
- Investigate the Transport and Disposition of OGD Wastewater

Air Quality Priority Research Needs

- Air Quality Modeling
- Source Emissions Measurements
- Ambient Air Measurements
- Exposure Assessment

- Emission Mitigation.
- Support Development of Engineering Controls, Technologies, and Strategies for Emissions Control during OGD Operations

Effects on Human Health Priority Research Needs

- Toxicity Assessment
- Health Studies

Ecological Effects Priority Research Needs

- Information Gap Analysis
- Wastewater Toxicity Testing
- Vulnerability Assessments
- Cumulative Impact Models

GOAL OF THE RFA

This RFA seeks proposals that address one or more of the priority research needs identified in the Strategy in the Appalachian Basin region. Currently, multiple federal agencies are involved in OGD research. In addition, public and private sector organizations including academia, industry, and NGOs are conducting such research. Applicants are both expected to be knowledgeable of these research efforts and encouraged to collaborate with others to both strengthen their proposals and maximize the use of EPA resources.

SPECIFIC RESEARCH INTERESTS

This RFA seeks proposals that address one or more of the **Water Quality** and **Human Health Priority Research Needs** identified in the Strategy in the Appalachian Basin region, listed in Section **B. Background.** Applicants should address one or more of the following research questions:

- What are the impacts to water quality from OGD, including impacts from construction, hydraulic fracturing, drilling and well treatment, pipelines, waste disposal facilities, surface groundwater interfaces, and other associated activities?
- What are the short term and long term impacts of releases from OGD on water quality and how does the activity change water quality within the watershed, pool, and basin?
- What are the potential combined effects of OGD-related chemical and non-chemical stressors?
- For accurate total exposure assessments of OGD operations in the Appalachian Basin, how can regular emissions and accidental releases of chemical pollutants be quantified? For example, a database of actual contaminations that have occurred during OGD operations in the Appalachian Basin in the past decade would be valuable for public awareness and decision making for public health and environmental protection.

WRITING TEAM

The writing team is consisted of individuals from across Agency program offices and regions.

- **ORD/NCER:** Darrell Winner, Michael Hiscock, Sherri Hunt, Intaek Hahn, Terry Keating
- **SHC IO:** Kevin Summers
- **ORD/NRMRL:** Brian Gullett, Tiffany Yelverton, Eben Thoma
- **Region 9/IOAA:** Jose Zambrana
- **SSWR IO:** Christopher Impellitteri
- **Region 3:** Angela McFadden, Amy Bergdale
- **NERL:** James Lazorchak, Brent Johnson, Andrew Gillespie, Gayle Hagler, Ann Grimm
- **OAQPS:** Bruce Moore
- **OW:** Scott Wilson, Kathryn Kazior, Jill Dean, William Bates

PROPOSED FUNDING:

- Non-STAR, Congressional Mandate Budget, FY16 $3 Million
- Estimated Number of Awards: ~~8~~ 4 awards, up to ~~$999,000~~ 750,000 per award, including direct and indirect costs are planned.
- Project period will be 3 years.
- Anticipated Type of Award: Grant

DISCUSSION POINTS

- RFA will be open for 45 days.

Attachment B: Meeting Notes for Joint Concurrence on the 2016 RFA, "Oil and Gas Development in the Appalachian Basin."

Meeting Attendees: in the room: Jim Johnson, Mary Ellen Radzikowski, Jeff Frithsen, Roberto Perez, James Gentry, Sylvana Li, Sherri Hunt; on the call: Mike Slimak, Dan Costa, Suzanne VanDrunick, Kevin Teichman, Chris Impellitteri, Alan Vette, Kelly Widener, Darrell Winner, Michael Hiscock, Meta Bonner.

Major Comments/Recommendations:

Dan Costa: Research Scope is still too broad and it will be difficult to make funding decision. Questions why this RFA is a non-STAR.

Suzanne VanDrunick: Recommend that we have 4 awards at $750K each. Has problems with Background language talking about economy, energy security, and recommend a revision.

Mike Slimak: Minor wording changes are recommended for health research question (exposure assessment language).

Chris Impellitteri: Change language on health research question.

Kevin Teichman/Jeff Frithsen: We can put primary focus on Strategy Research Needs that EPA is designated as a leading agency in the first RFA and consider the Strategy Research Needs that EPA is supporting as secondary questions if necessary.

James Gentry/Meta Bonner: The RFA must be divided into a number of different RFA's per research topic such as Water, Health, Air, etc, for manageability of peer review. PPRD may need more time to process the peer reviews.

Roberto Perez: This RFA is non-STAR and different CFDA applies.

Jim Johnson: Path forward is set. Will address all of the above recommendations/comments by NPD's. Research scope must be reduced.

Post- Concurrence Development:

The 2016 Congressional Mandated OGD in Appalachian Basin RFA will just be SSWR and SHC joint effort. In 2017, ACE and SHC will collaborate, pending final availability of funds.

EPA

Oil and Gas Development in Appalachian Basin RFA Concurrence Meeting

Intaek Hahn, Project Officer

National Center for Environmental Research

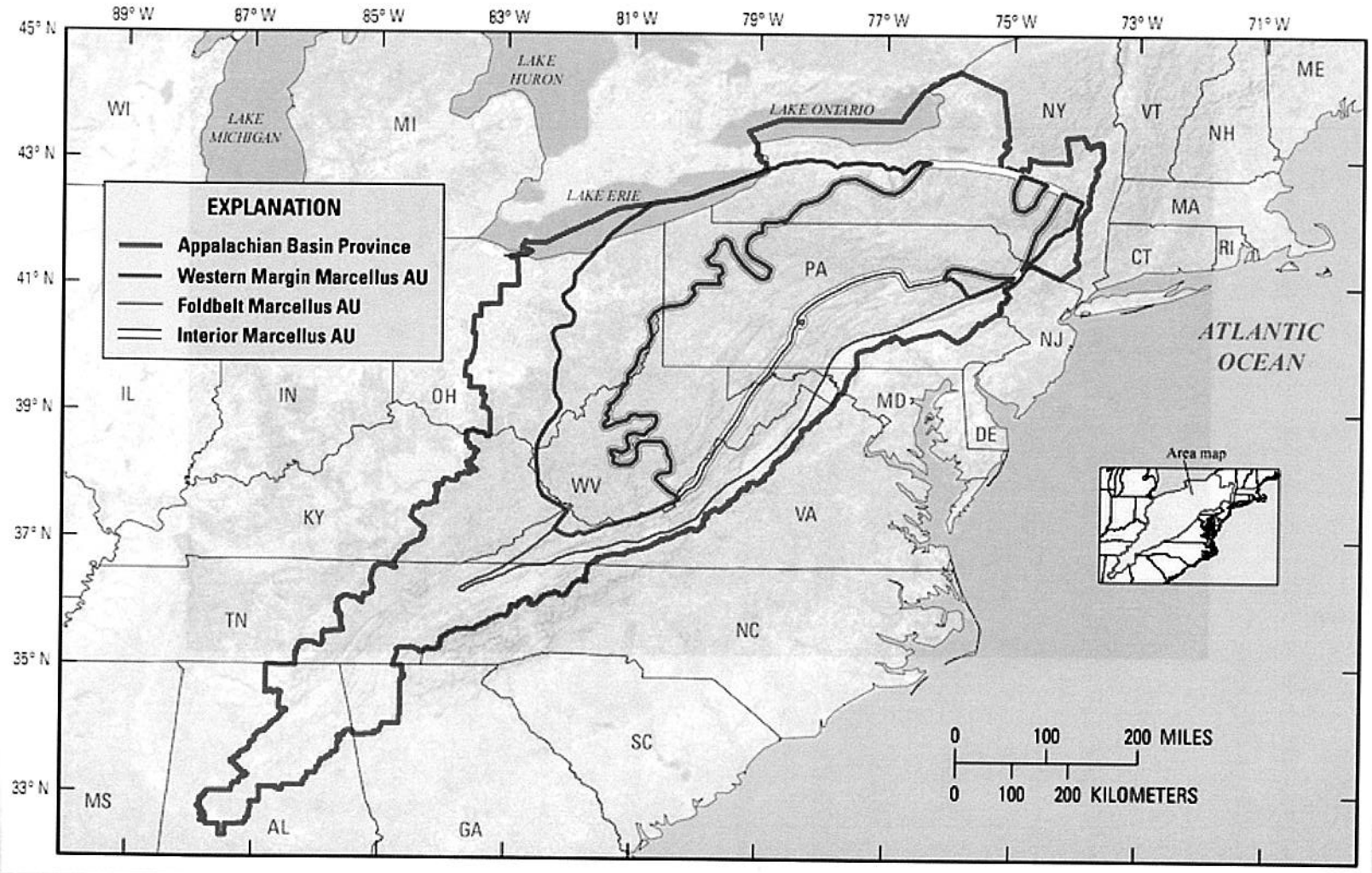
July 11, 2016

EPA

Joint ACE, SHC, SSWR Collaboration

Darrell Winner, Senior Science Advisor
Michael Hiscock, SSWR MI
Sherri Hunt, ACE MI
National Center for Environmental Research

The Appalachian Basin



Concept Meeting: MAJOR AREAS OF RESEARCH QUESTIONS

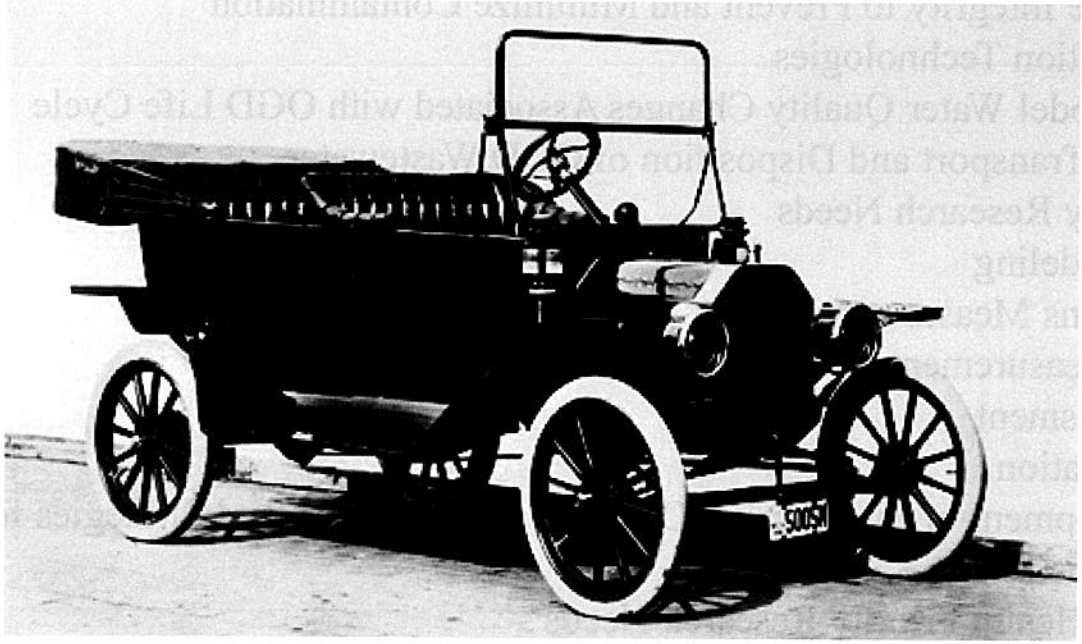
THREE MAJOR AREAS OF RESEARCH QUESTIONS:

- **Stressor and Exposure Characterization**
  - Emissions and air quality
  - Water pollution, water qualtiy and sustainability
  - Total human exposure
- **Health impacts in holistic, total environment framework**
  - Environmental Impacts (air, water, ecology, local, regional)
  - Health effects from exposure to the primary environmental stressors (chemical stressors from OGD) with secondary, OGD-related non-chemical stressors as modifiers.
  - Near-term and long-term ecological and public health effects
  - Ecological health integrated with human health
- **Evaluation of Most Effective Practices**
  - Air/water pollution control and prevention
  - Sustainable practice/solution
  - Community planning/resiliency
  - Public health and ecosystem service

Concept Meeting Recommendations

- Reduce scope and number of research topics and questions
- Go with 3 $999K awards
- Make sure to include non-chemical stressors potentially interacting with chemical stressors
- Make sure to ask for statistical database of actual contaminations occurred

SCOPE OF RESEARCH DEBATE



2014 Federal Research Strategy (Background Section of the RFA)

Water Quality Priority Research Needs

- Determine the Impact of Well Injection (Hydraulic Fracturing Fluids) and Produced Waters on Water Quality
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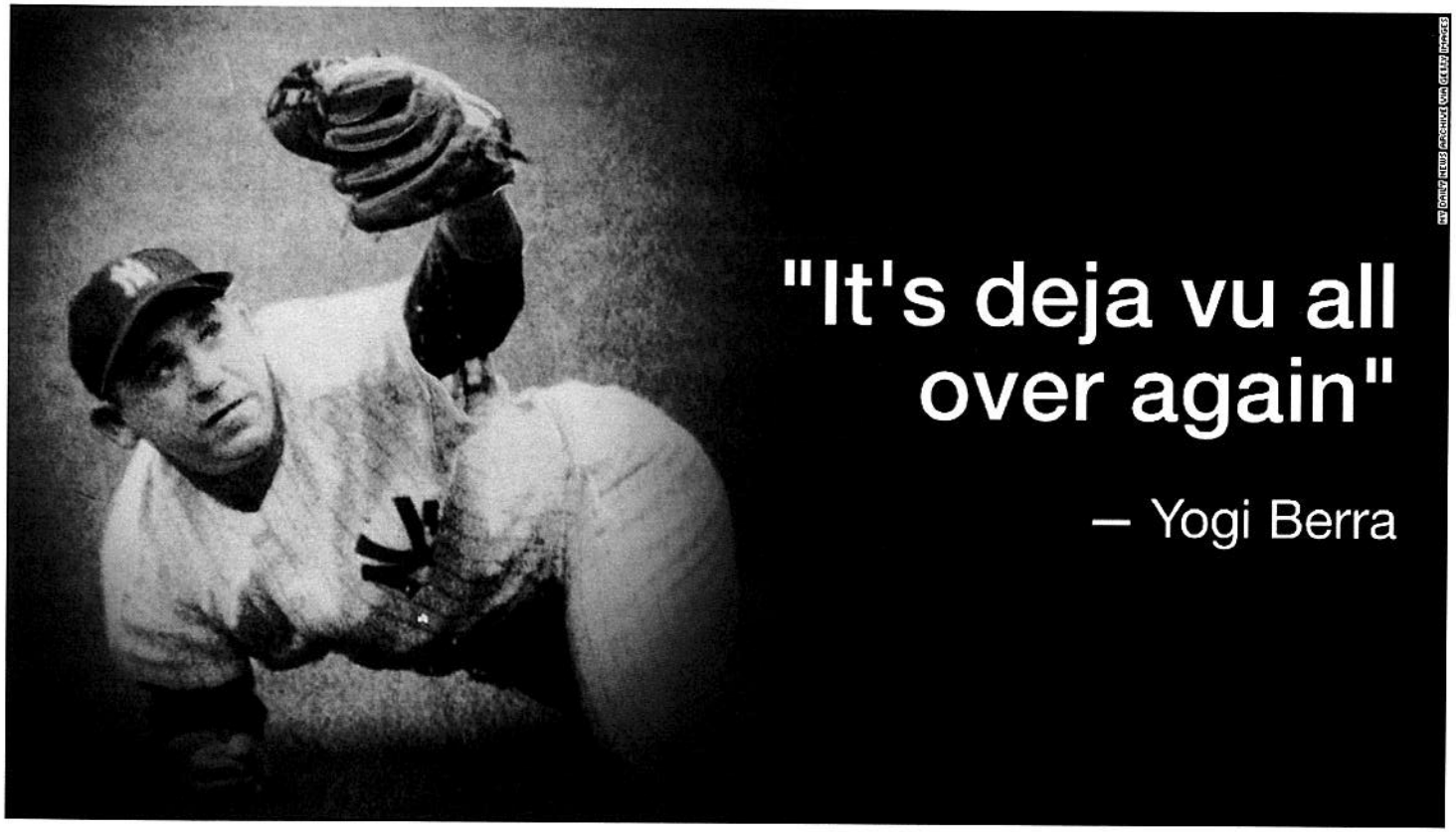
Goal of the RFA

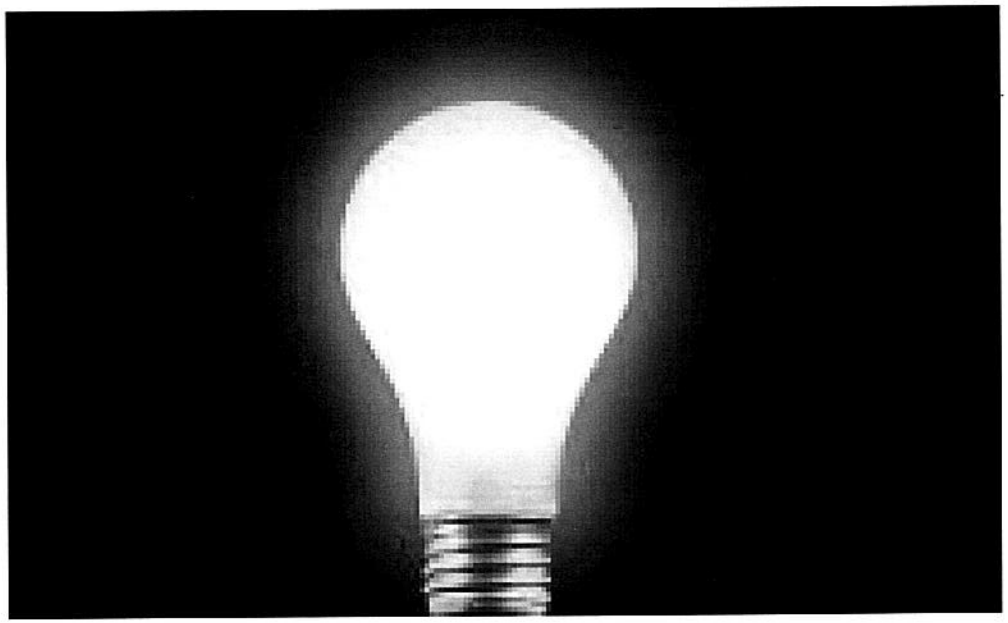
- **Non-STAR Congressional Mandate**
- **Addressing Congressional Request and Faithfully Carrying out EPA Strategic Research Action Plans**
- **First year RFA leading to more specific RFA's in future years**

Major Example Research Questions

- What are the impacts of emissions from OGD on air quality? What are the contributions of emissions from OGD to air toxics and criteria air pollutants? What indicator compounds can be identified to be used as markers for emissions from OGD operations? How do these emissions change over the major stages of development during the lifetime of OGD operations?
- What are the impacts to water quality from OGD, including impacts from construction, hydraulic fracturing, drilling and well treatment, pipelines, waste disposal facilities, surface groundwater interfaces, and other associated activities? What are the short term and long term impacts of releases from OGD on water quality and how does the activity change water quality within the watershed, pool, and basin?
- In order to assess accurate total exposure risks of OGD operations in the Appalachian Basin, how can regular emissions and accidental releases of chemical pollutants be quantified? For example, a statistical database of actual accidental contaminations which occurred during OGD operations in the Appalachian Basin in the past decade would provide valuable insights in assessing risks to the environment and human health. What are the potential combined effects of OGD-related chemical and non-chemical stressors?


"It's deja vu all over again"
– Yogi Berra
NY DAILY NEWS ARCHIVE VIA GETTY IMAGES

What we did since the concept meeting



Strains on Peer Review Process

- **Equivalent to 3 major RFA's**
- **Open for 45 days**
- **Fellowship Approach**

Conclusion

Meeting the Initial Recommendations from the Concept Meeting

- **Reduce scope and number of research topics and questions** ✓
- Go with 3 $999K awards
- Make sure to include non-chemical stressors potentially interacting with chemical stressors ✓
- Make sure to ask for statistical database of actual contaminations occurred ✓

Thank you for your attention